

REMARKS

Applicant respectfully requests reconsideration of this application in view of the following remarks.

Claims 1-5 and 7-14 are pending in this application. Each of the claims have been rejected and are hereby traversed.

The Office Action has rejected claims 1, 3, 5, 7-9, 11, and 13-14 under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent Publication 2002/0039232 to Takeyama ("Takeyama"). The Office Action has also rejected claims 1, 3-5, 7-9, and 11-14 under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 7,012,756 to Takagi ("Takagi"). The Office Action has also rejected claims 2 and 10 under 35 U.S.C. § 103(a) as allegedly being obvious over Takeyama in view of U.S. Patent Publication 2002/0180907 to Imamura ("Imamura") and also over Takagi in view of Imamura.

Independent claims 1 and 9 each recite that "a combined optical power provided by an emergent surface of the second optical element and an incident surface of the first optical element is a negative optical power."

Rejections based on Takeyama

The Office Action asserts that a structure shown in figure 1 of the present application corresponds to respective structures of Takeyama (Office Action dated 10/5/2006 at page 4 line 7, page 6 line 12). Specifically, the Office Action states that "the emergent surface of the second optical element and the incident surface of the first optical element appear to have a negative power because of the similarity of the shape of the space of Takeyama to the shape of the space shown in figure 1 of the applicant's drawings." Applicant respectfully submits, however, that claims 1 and 9 do not refer to the structure of Embodiment 1 (corresponding to figure 1) of this

application. Accordingly, Applicant respectfully submits that independent claims 1 and 9 are allowable in view of Takeyama.

Rejections based on Takagi

Applicants also respectfully submit that Takagi does not teach that “a combined optical power ... is a negative optical power” as recited in independent claims 1 and 9. In figure 17 of Takagi, refractive power (corresponding to “a combined optical power” recited in claims 1 and 9) of an air lens formed by surfaces S8 and S7 is positive (not negative) since the surface S8 ($R=15.9216$) protrudes toward the surface S7 and the surface S7 ($R=-67.1042$) protrudes toward the surface S8. Thus, Equation 1 of this Office Action is incorrect. (Office Action dated 10/5/2006 at page 8).

Each surface S8 and S7 is FFS (rotation asymmetrical surfaces) and the value R of each surface S8 and S7 shown in TABLE 1 is R (which is radius of curvature of reference surface) in Equation 1 of Takagi (see column 24). It is necessary to consider that surfaces S8 and S7 are FFS.

In figure 17 of Takagi, three light rays emitted from a center of an image taking surface SI are guided to the surface S8 while converging in a second optical system 20. In addition, the light passed through the surface S7 is further converged. Therefore when respective optical powers of surfaces S7 and S8 are combined, this combined optical power (which is optical power of the air lens formed by the surfaces S7 and S8) is positive optical power. Accordingly claims 1 and 9 are allowable in view of Takagi.

Additional Basis for Allowance

Additionally, independent claim 9 recites that “an inner product which is formed between outer products ... is negative.” Takeyama and Takagi do not teach or suggest this feature.

It is demonstrated with reference to attached figure 1 that the inner product between outer products is negative.

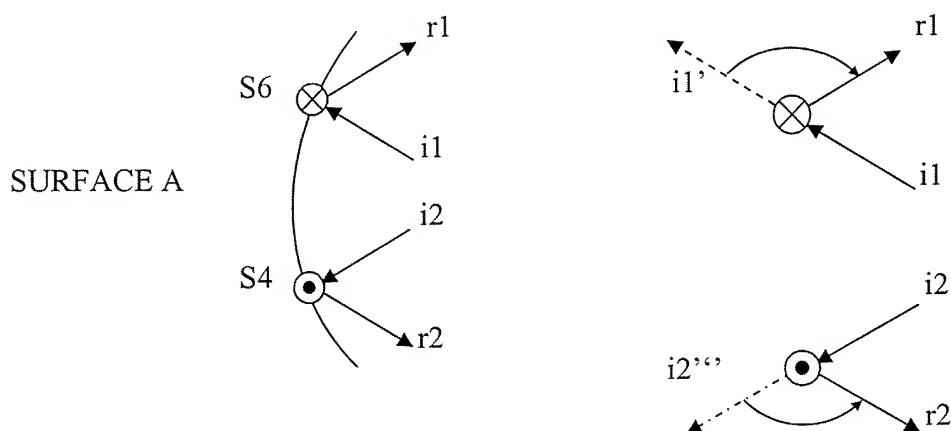


Figure 1

In respective structures of Embodiments 2 and 3 (see figures 2 and 3) of this application which are described in claim 9, the direction of outer product when light is reflected at reflective surface S6 is opposite to the direction of outer product when light is reflected at reflective surface S4.¹ Thus the inner product between these outer products is negative. In a case where light is reflected at the reflective surface S6, direction of outer product formed by a vector

¹“Outer product” is explained with reference to attached figure 3. As shown in figure 3, the direction of outer product $A \times B$ is upward. On the other hand, the direction of outer product $B \times A$ is downward.

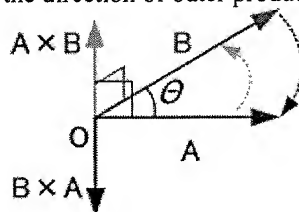


Figure 3

“i1” of incident light and a vector “r1” of reflected light is the direction from the face side to the reverse side of this paper.

On the other hand, in a case where light is reflected at the reflective surface S4, direction of outer product formed by a vector “i2” of incident light and a vector “r2” of reflected light is the direction from the reverse side to the face side of this paper. In attached figure 2 (corresponding to Embodiment 1 of this application), the direction of outer product formed by a vector “i1” of incident light and a vector “r1” of reflected light is same as the direction of outer product formed by a vector “i2” of incident light and a vector “r2” of reflected light. In this case, an inner product formed by two outer products is positive. As discussed above, however, claims 1 and 9 do not refer to the structure of Embodiment 1 (corresponding to figure 1) of this application.

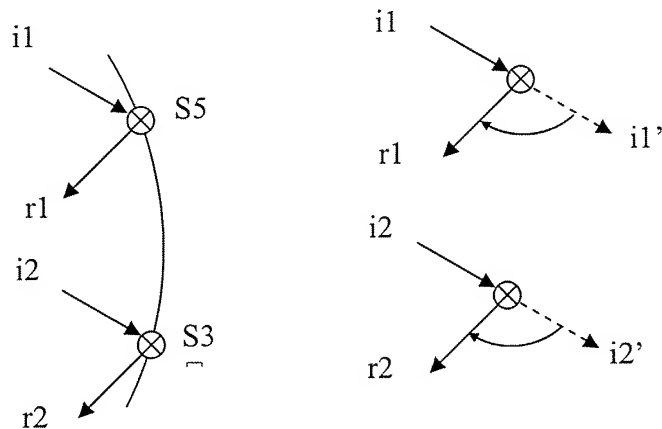


Figure 2

Accordingly, Applicant respectfully submits that this further demonstrates that claim 9 is in allowable form.

With respect to the secondary reference Imamura, the Office Action has not asserted it to alleviate any of the deficiencies discussed above.

Since claims 2-5 and 7-8 depend from claim 1, and since claims 10-14 depend from claim 9, Applicant respectfully submits that these claims are also in allowable form.

Applicant has chosen in the interest of expediting prosecution of this patent application to distinguish the cited documents from the pending claims as set forth above. These statements should not be regarded in any way as an admission that the cited documents are, in fact, prior art. Likewise, Applicant has not specifically addressed the rejections of the dependent claims. Applicants respectfully submit that the independent claims, from which they depend, are in condition for allowance as set forth above. Accordingly, the dependent claims are also in condition for allowance. Applicant, however, reserves the right to address such rejection of the dependent claims in the future as appropriate.

CONCLUSION

For the above-stated reasons, this application is respectfully asserted to be in condition for allowance. An early and favorable examination on the merits is requested. In the event that a telephone conference would facilitate the examination of this application in any way, the Examiner is invited to contact the undersigned at the number provided.

AUTHORIZATION

While no fees for an extension of time are believed necessary for this paper, should an extension of time be required for the timely submission of this paper, such extension is hereby petitioned, and the Commissioner is hereby authorized to charge any additional fees which may be required for this paper, or credit any overpayment, to Deposit Account No. 13-4500, Order No. 1232-5416.

Respectfully submitted,
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